

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
23 October 2003 (23.10.2003)

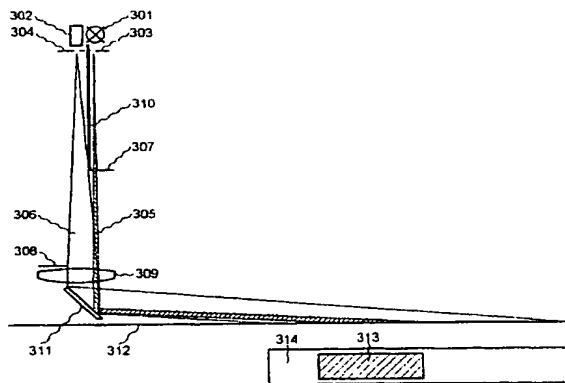
PCT

(10) International Publication Number
WO 2003/087792 A3

- (51) International Patent Classification⁷: **G01N 21/55**, 21/47, F21V 11/14, G01N 21/88
- (74) Agent: **ZACCO DENMARK A/S**; Hans Bekkevolds Allé 7, DK-2900 Hellerup (DK).
- (21) International Application Number: **PCT/DK2003/000222**
- (22) International Filing Date: **2 April 2003 (02.04.2003)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:
PA 2002 00561 15 April 2002 (15.04.2002) **DK**
- (71) Applicant (for all designated States except US): **DELTA DANSK ELEKTRONIK, LYS & AKUSTIK [DK/DK]**; Venlighedsvej 4, DK-2970 Hørsholm (DK).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **HANSEN, Jan, Harries [DK/DK]**; Hjortekærvej 125A, DK-2800 Lyngby (DK). **NIELSEN, Hans, Ole [DK/DK]**; Hjortekærvej 126, DK-2800 Lyngby (DK). **SØRENSEN, Kai, Ove [DK/DK]**; Frem 41, DK-2800 Lyngby (DK). **OFFERGAARD, Jesper, Falden [DK/DK]**; Ingevej 26C, DK-2740 Skovlunde (DK).
- (81) Designated States (*national*): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:**
— with international search report
- (88) Date of publication of the international search report:
24 June 2004

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR MEASURING LIGHT REFLECTIONS OF AN OBJECT



(57) Abstract: A method and apparatus for measuring light reflections of an object, comprising a light-source illumination-observation assembly, the assembly comprising: (A) an illumination unit comprising an illumination light source and illumination aperture stop being arranged to provide a confined luminous field, an illumination field stop (307) adapted to provide an illumination beam (305) of light from said confined luminous field, an collimating optical element (309) adapted to collimate said illumination beam and to provide an illumination field (313) on an object; (B) an observation unit comprising: at least one observation field stop adapted to provide an observation beam (306) comprising a ray boundary, at least one focusing optical element (309) adapted to focus said observation beam, an observation light receiver; and (C) at least one common optical element (309) arranged so that said illumination beam and said observation beam form an overlap therein; and (D) a unit separation stop (310) adapted to stop light from said illumination unit in reaching said observation light receiver of said observation unit; wherein said at least one observation field stops (308, 310, 311) comprises at least one limiting field stop (310) adapted to limit said ray boundary of said observation beam and to maintain said overlap of said illumination beam and said observation beam; a diffuser light-source assembly; and use thereof.

WO 2003/087792 A3



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/DK 03/00222

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G01N21/55 G01N21/47 F21V11/14 G01N21/88

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01N G03B F21V

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DELTA: "On site quality control of road markings & road surfaces in accordance with CEN specifications" LTL2000 RETROMETER, MANUAL, 'Online! 11 March 1999 (1999-03-11), pages 1-49, XP002225022 Retrieved from the Internet: URL: http://www.delta.dk/services/products/road-test-equip/04_manua/ltl2000/manua_uk.pdf > 'retrieved on 2002-11-24! page 48	1-6,9, 10,12, 13,22, 24,26,27
A		11
A	WO 97/27470 A (DELTA LYS & OPTIK ;NIELSEN HANS OLE (DK); HANSEN JAN HARRIES (DK)) 31 July 1997 (1997-07-31) figure 4	3,6,8



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

4 March 2004

Date of mailing of the international search report

25. 03. 2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Verdoodt, E

INTERNATIONAL SEARCH REPORT

International Application No

PCT/DK 03/00222

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 839 812 A (GE XIAOQIN ET AL) 24 November 1998 (1998-11-24) column 3, line 66 - column 5, line 5 -----	16-18, 20,21
X	US 5 777 244 A (FUKAZAWA FUMIO ET AL) 7 July 1998 (1998-07-07) figure 3f column 4, line 56 - line 59 column 5, line 30 - line 33 -----	16-19
X	GB 2 110 416 A (KALNEW OPTICAL IND) 15 June 1983 (1983-06-15) figure 1 page 1, line 104 - line 108 -----	16-18
A	US 4 250 538 A (DURBIN JOHN A ET AL) 10 February 1981 (1981-02-10) figure 3 -----	16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 03/00222**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-15,22,24-27

Apparatus and method for measuring light reflections of an object

2. claims: 16-21,23

Diffuser light-source assembly

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/DK 03/00222

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9727470	A	31-07-1997	DK 6196 A	23-07-1997
			AU 1366497 A	20-08-1997
			DE 69620640 D1	16-05-2002
			DE 69620640 T2	13-02-2003
			WO 9727470 A1	31-07-1997
			EP 0876597 A1	11-11-1998
			JP 2000503395 T	21-03-2000
US 5839812	A	24-11-1998	NONE	
US 5777244	A	07-07-1998	JP 9061363 A	07-03-1997
GB 2110416	A	15-06-1983	JP 58092920 A	02-06-1983
			BE 895171 A1	16-03-1983
			US 4482245 A	13-11-1984
US 4250538	A	10-02-1981	BR 7907859 A	16-09-1980
			CA 1123802 A1	18-05-1982
			DE 3062856 D1	01-06-1983
			EP 0016555 A1	01-10-1980